Field Report 18

PROCESSING OF SUGARCANE AND RAW SUGAR IN VIETNAM
An Economic Appraisal

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FOREWORD

This study is one of a series of marketing studies conducted by the U.S. Department of Agriculture in cooperation with the U.S. Agency for International Development and the Ministry of Land Reform, Agriculture, Fishery and Animal Husbandry Development of the Government of South Vietnam.

This marketing series is part of a still larger ERS Vietnam project. The first phase of the larger project was a review of Vietnam's 5-Year Rural Economic Development Plan, with a report published in December 1971. Other phases being completed now are a series of demand and price studies and a linear programming model to study production-distribution relationships for farm commodities.

The purpose of the several series of studies is threefold. The first is to develop a body of economic information from readily available sources for immediate use by the Ministry and USAID Mission in making decisions regarding development of Vietnam's agricultural sector. Secondly, the research methodology used and the economic information developed are to provide a basis for work by the recently-established Directorate of Agricultural Economics. Finally, it is expected that the participation of members of the Ministry staff in the conduct of these studies, together with any specialized training associated with the project, will acquaint them with the research procedures followed so that the analysis can be continued and improved in the future.

The marketing series, of which this report is a part, provides detailed descriptions of marketing systems for several major farm products, supplies marketing input data required for the production-distribution model mentioned above, and assesses the need for changes in the marketing systems. Assessment of the need for change was based primarily upon (1) the relationship of the costs incurred in providing the services required to move farm commodities from farms to consumers and the marketing charge, or margin, for these services; and (2) the extent to which the existing marketing systems provide the services currently required or expected to be demanded in the near future by growers or consumers. Covered in the reports are livestock products, oilseed processing, sugarcane and raw sugar processing, swine, poultry, horticultural crops, grains, and transportation.

Personnel of the Marketing Economics Division of USDA's Economic Research Service had prime responsibility for the studies under Participating Agency Service Agreement No. SA/VN(AJ)103-72. However, many others also deserve recognition for their cooperation and assistance, including other Ministries of the Government of Vietnam; the farmers, merchants, and others in Vietnam's private sector; and the staff of the U.S. AID Mission to Vietnam. Particularly helpful in the sugar processing study were: Robert Ralston, USDA/PASA adviser with the Office of the Associate Director of Food and Agriculture, USAID; Ngyen Van Hai, Ngyen Can Nam, and Ton That Trinh, general managers of the three government-owned sugar companies; and Mr. Vuong, Vietnam Agricultural Economic and Statistical Service.

- William A. Faught
Project Coordinator

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SUMMARY AND CONCLUSIONS

Considerable increase in the domestic demand for sugar has occurred during the past 10 years. Some capacity is available for processing a part of the needed supply from sugarcane, but security conditions have prevented its use. Foreign exchange needed for the approximately 300 thousand M.T. of sugar imported annually is substantial for the economy.

The government-owned sugar companies are charged with the primary responsibility of making the country self-sufficient in sugar production. Efforts are underway to obtain approval for new investments in cane processing plants. The advisability of making additional investments is questionable until present facilities can be secured and utilized. In addition, the question of best use of agricultural land in the proposed plant areas has not been adequately resolved. The cost of producing and processing sugarcane is greater than the cost of imported sugar; therefore, new sugar facilities should not be built until they are determined to be in the best interest of the country's overall developmental goals.

PROCESSING OF SUGARCANE AND RAW SUGAR IN VIETNAM-- AN ECONOMIC APPRAISAL

INTRODUCTION

Enough sugarcane production for Vietnam to become self-sufficient for sugar is a government goal. Sugar imports have increased dramatically over the last few years. These imports require a considerable amount of foreign exchange and there is general feeling that these dollars could be better spent for industrial goods.

This study, which was sponsored by the U.S. Agency for International Development, appraises the alternative means of supplying Vietnam's domestic sugar requirements, and points out some of the effects of each alternative. Obviously, the choice of a "best" option cannot be made in this context since there may be overriding considerations from the standpoint of the total economy.

PAST PRODUCTION, CONSUMPTION, AND PRICES

Sugarcane Production and Utilization

Land area devoted to sugarcane production has declined more than half since 1965 (Table 1). As a result of this and a slight yield reduction, the total tonnage produced has decreased even more. The years 1969 and 1970 had the lowest production since 1958 and appear to be the lowest of record. 1/

A major portion of the sugarcane has for years been consumed fresh (Table 1) in the form of cane juice and chewing cane. Small artisan mills previously processed a substantial quantity, but this has declined in recent years.

Sugar production in commercial mills has shown considerable variation since the first factory was built during the 1920's. Security conditions have contributed to this instability, even to the point of prohibiting operation of commercial plants since 1966.

Sugarcane is produced in most provinces, but is of very minor importance in the Central Highlands. The major production area has been the provinces around Saigon. Next in importance are the Central Lowland provinces of Binh Dinh, Phu Yen, Quang Nam, and Quang Ngai.

1/ See A. S. Nemir and Associates, "Sugar Production Potentials and Steps to Sugar Self-Sufficiency in South Vietnam," Washington, D.C., November 1957, for years prior to 1958.

Table 1.--Sugarcane production and utilization in Vietnam, 1958-71

Year	Sugarcane		Sugarcane utilization		
				Sugar production	
	Hectares	Thousand M.T.	Fresh	Artisan mills	Commercial plants
			------ Percent of production ------		
1958	25,330	761	53	44	3
1959	29,200	824	56	33	11
1960	32,760	1,000	52	35	13
1961	31,855	932	43	42	15
1962	28,620	872	18	69	13
1963	31,020	964	8	82	10
1964	33,720	1,055	3	86	11
1965	33,910	1,093	52	37	11
1966	30,050	936	74	22	2
1967	25,770	770	86	14	0
1968	15,265	426	87	13	0
1969	11,670	321	83	17	0
1970	12,000	356	84	16	0
1971 (est) .	14,000	440	75	25	0

Sources: Agricultural Statistics Yearbooks
Statistical Yearbooks
Vietnam Sugar Company Annual Reports

Sugar Supply and Consumption

Sugar consumption has increased considerably since 1958, both in total and per capita (Table 2). The source of sugar has shifted more and more to imports; because of the shortage of sugarcane production for the past 5 years, almost all sugar has been imported.

Total requirements of the country have increased because of a 50 percent population increase and increased per capita consumption. During 1962-1964, production of artisan sugar was estimated somewhat greater than for other years. Table 1 shows the use of sugarcane for fresh consumption to be quite

Table 2.--Sugar supply by sources and consumption, 1958-71

Year	Domestic production		Imports 1/		Total consumption		Per capita consumption	
	Artisan mills	Commercial mills	Raw	Refined	Including artisan	Excluding artisan	Including artisan	Excluding artisan
	1,000 M.T.						Kg.	
1958	25	2	18	25	70	45	5.4	3.5
1959	26	9	46	9	90	64	6.5	4.6
1960	31	11	59	10	110	80	7.8	5.7
1961	36	13	51	32	132	96	9.1	6.6
1962	55	11	61	29	156	101	10.5	6.8
1963	71	9	55	51	186	115	12.2	7.5
1964	80	10	53	66	209	129	13.3	8.2
1965	40	12	58	73	183	143	11.4	8.9
1966	20	2	66	84	172	152	10.4	9.2
1967	10	0	87	83	180	170	10.6	10.0
1968	5	0	86	97	188	183	10.8	10.5
1969	5	0	102	153	260	255	14.6	14.3
1970	5	0	116	173	294	289	16.1	15.8
1971 (est.)	10	0	120	180	310	300	16.5	16.0

1/ Imports are assumed to be consumed in the same year.

Sources: Agricultural Statistics Yearbooks
Statistical Yearbooks
Vietnam Sugar Company Annual Reports

low in those years for no apparent reason and suggests the possibility of error in the artisan sugar estimates. This would have contributed to the variability in per capita consumption of sugar, including artisan. Exclusion of the artisan sugar underestimates per capita consumption; but, by its exclusion, the changes in per capita consumption seem more in line with expectations. Moreover, artisan sugar production has been so low in recent years that it has had very little effect on the level of per capita consumption.

The supply of sugar (from domestic production and imports) in any given year was defined as the amount of sugar consumed in Vietnam. This does not take into account changes in stocks. Furthermore, it is recognized that some illegal export of sugar takes place. The effects of the former are believed minor, with very limited effect upon annual sugar consumption estimates; however, the latter may account for several thousand tons in some years, particularly 1969. The key to the extent of these illegal exports is found in the relative prices of sugar in S. Vietnam and Cambodia.

Prices

Sugar prices at wholesale are fixed by the Ministry of Economy. They are subject to change quarterly. Prices that went into effect February 11, 1972, and the two previous sets of prices are as shown in Table 3.

Table 3.--Wholesale sugar prices, Saigon

Type of sugar	Saigon wholesale price per kilogram (f.o.b.)		
	February 1972 to date	March 1971 to February 1972	October 1970 to March 1971
	VN$		
Imported raw	115	65	42.50
Affinated	135	70	--
Plantation white	145	80	44.50
White (refined)	150	100	45.50

The last two price increases varied by type of sugar. The refined white sugar price more than tripled. This widened the price differential between raw and white sugar from VN$3 to VN$35.

The March 1971 increase in fixed prices seemed designed to accomplish several things. It encouraged the refining of imported raw sugar by widening the price differential. Second, it provided a price incentive to encourage expanded production of sugarcane for processing. Third, the higher prices

brought Vietnam's prices in balance with Cambodia's, and cut off the illegal exports. Finally, assuming the demand for sugar is not perfectly inelastic, it should have curtailed consumption. The latter would have reduced the level of imports and the amount of foreign exchange required. The February 11, 1972, price increase was primarily in response to higher prices on the world market for sugar.

Wholesale prices of refined white sugar f.o.b. Saigon and the date each became effective are as follows:

Effective date	Wholesale price per kilogram
August 1, 1961	VN$ 16.00
October 28, 1961	17.00
June 14, 1963	20.40
September 1, 1963	25.70
March 2, 1964	28.85
July 10, 1965	25.80
February 15, 1969	35.50
October 3, 1970	45.50
March 6, 1971	100.00
February 11, 1972	150.00

Saigon retail prices of refined white sugar, 1968 through 1970, averaged VN$33.9, 44.6, and 54.8, respectively. The wholesale-retail price spread for 1968-69 averaged VN$9, but almost doubled in 1970 when it reached VN$16.8. Currently, the retail price markup is fixed at 7 percent of the wholesale price.

Monthly and annual prices of sugar on the market for export are available, but the appropriate price for Vietnam is cost plus freight (c.f.) to Saigon. Because of the volatile nature of world sugar prices and ocean freight rates, it is very difficult to estimate the c.f. price. For example, the freight rates per M.T. for raw sugar from Brazil to Saigon for 1969-71 had annual highs and lows as follows:

Year	High/M.T.	Low/M.T.
1969	US$16.50	US$10.75
1970	24.50	19.00
1971	8.75	7.10

There is no monthly cost estimate for shipping sugar to Saigon from Caribbean or European ports. Also, Vietnam purchases raw and white refined sugar at irregular intervals. These seasonal variations in imports influence the annual average prices paid and, hence, the price differential.

Annual average prices (c.f. Saigon) for raw and refined white sugar purchased by Vietnam in 1969-71 are as follows:

Year		Raw/M.T.	White/M.T.
1969		US$105.80	US$107.15
1970		105.62	104.57
1971		121.25	143.72
	Average	110.89	118.48

These prices show at least one interesting variation; the cost of raw sugar was higher than refined in 1970. In addition to the seasonal factors that contributed to the higher raw sugar price, there was the same price bid for both types of sugar during roughly the last six months of the year. Nevertheless, the 3-year average of annual prices was US$110.89 for raw sugar and US$118.48 for white. The average price differential was US$7.59, which reflects some of the additional costs of refining and transporting. Information obtained from an export-import firm indicates this price differential is low; US$25 is considered a more accurate figure.

PRESENT STATE OF SUGAR INDUSTRY

Sugarcane Production

Restrictions have been placed on sugarcane production for security reasons. These limit field sizes and the distance between cane fields and roads and streams. In addition, growers run the risk of having their cane fields burned in the event security deteriorates. Such conditions are not conducive to establishing large growing areas with the high sugarcane density required for a commercial sugar mill.

Another problem that limits the profitability of sugarcane production is the low yield per hectare. Historically, yields have run from 25 to 40 M.T. per hectare annually. Studies of the relative profitability of alternative enterprises suggest that, under these conditions, other uses of farm resources may be more profitable.

Fortunately, the experiment stations in Vietnam are testing varieties and improved cultural practices. Results of these tests show that yields of 90 M.T. per hectare can be achieved with some varieties under irrigated conditions. This potential increase in productivity indicates that per unit production costs can be lowered and, hence, the relative profitability of the sugarcane enterprise should be improved.

Processing Facilities

Vietnam has three types of processing facilities--artisan mills, centrifugal mills, and refineries. Artisan mills are located in rural areas. At one time these mills numbered in the hundreds and were known as buffalo mills. Many are no longer in operation, and most of those remaining use combustion engines for power. It is not known just how many of these mills continue to operate.

There are three centrifugal type sugar mills. These produce a plantation white grade of sugar using the sulphitation process. The oldest plant, dating back to 1926, is located at Hiep Hoa in Hau Nghia Province. Its capacity is 1,800 M.T. of sugarcane per day, some 200,000 M.T. per year. The plant has not operated since 1966, however, and the deterioration which has occurred by its remaining idle for 5 years, plus some war damage to its distillery, worker housing, and an oil storage tank, will mean substantial repair and maintenance before it can begin processing anew.

The other two sugar mills are located in the provinces of Binh Duong and Quang Ngai. The plants are identical in size and processes. Each has a capacity of 1,500 M.T. of sugarcane daily, or some 200,000 M.T. annually.

Aside from some minor technical problems, the Quang Ngai plant is operational. A test batch of sugarcane was processed in October 1971. At that time plans were made to process about 80,000 M.T. of sugarcane in the early part of 1972, initially using the bagasse to fire the boilers.

Sugarcane is delivered to the Quang Ngai plant by land. In plans prepared in 1959 by the Taiwan Sugar Corporation Technical Team, this facility was to have a considerable network of roads and bridges. At present these new and improved roads have not been built. Moreover, there is no indication of plans for developing the proposed roads. It is questionable if present roads can accommodate daily delivery of 1,500 M.T. of sugarcane.

The Binh Duong plant can receive sugarcane by land and water. However, the plant is not yet operable since it is only about 90 percent complete. Conditions of roads, rivers, and canals were not determined specifically, but none of the planned improvements have been made.

Vietnam has two refineries which produce refined white sugar from raw sugar. The Khanh Hoi refinery is in the Cholon area of Saigon. It began operation in 1953 and has a capacity of 50,000 M.T. of refined white sugar per year.

The second refinery is located at the Bien Hoa Industrial Center. It is actually three plants, two for affinated sugar production and one for refined white sugar. In 1966, equipment for affinated sugar production was moved to Bien Hoa from the Hiep Hoa plant following a VC attack. Its annual production capacity is 60,000 M.T. The second affination plant has an annual capacity of 120,000 M.T. (Affinated sugar is made from raw sugar by a simple process of washing the molasses from the surface of the sugar crystal.)

The third unit at Bien Hoa is a modern, highly mechanized refined white sugar plant. It has an annual capacity of 60,000 M.T. Both white sugar refineries package in 1, 5, 50, and 100 kilogram bags.

Adjacent to the Bien Hoa refinery plants are an alcohol and rum distillery and a jute bag factory. The distillery has a production capacity of 5,000 liters of pure alcohol per day. Jute bags can be manufactured at the rate of 10,000 100-kilogram bags per day.

In summary, the centrifugal sugar mills have a combined annual processing capability of approximately 600,000 M.T. of sugarcane. This quantity of sugarcane would be expected to yield about 55,000 M.T. of plantation grade sugar. This production, plus the refining of imported raw sugar, gives Vietnam an annual processing capability as follows:

Type sugar		Metric tons
Affinated		180,000
Plantation		55,000
White		110,000
	Total	345,000

This summary does not take into account the artisan or noncentrifuged type sugar since the total productive capacity of these mills is unknown.

Structure

The sugar industry is controlled by the Government of Vietnam (GVN). Previously mentioned is the fixing of wholesale prices by the Ministry of Economy. In addition, there is the Sugar Development Committee which is responsible for assisting the development of the sugar industry. Funds for developing the sugar industry are derived from duties placed on imported sugar. These funds are administered by the Ministry of Economy.

Artisan mills are privately owned and buy sugarcane from local farmers as well as producing their own. GVN control over owners of these facilities is primarily through price controls placed on sugar at wholesale.

All centrifugal sugar mills and sugar refineries are owned by GVN and operated by three government companies. Each company has its own staff, a general manager, and a board of directors. Two of these companies are the Binh Duong Sugar Company and the Quang Ngai Sugar Company. Each owns only one plant in the Province from which it derives its name. The third and oldest company is the Vietnam Sugar Company. Both refineries, the Hiep Hoa sugar mill, the distillery, and the jute bag factory are controlled by it.

Each of the sugar company general managers; representatives of each of the Ministries of Agriculture, Economy, and Planning; and a representative of the Research Institute comprise the membership of the Sugar Development Committee.

Taxation

Sugar importation accounts for a considerable amount of Vietnam's food imports and foreign exchange. In 1970 this amounted to US$30.5 million. However, another important factor is the amount of tax revenues derived from sugar imports. An example is a 1970 import shipment of refined white sugar.

Distribution of revenue based on the fixed wholesale price of VN$35.50 per kilogram was as follows:

Item	Wholesale price (Percent)
Necessary costs of handling:	
Cost of sugar delivered to Saigon (VN$80/US$1)	22.0
Insurance	1.8
Sugar company's permitted handling fee at 9 percent of c.i.f.	2.2
Interest	1.9
Unloading	3.9
Dock charges and demurrage	0.1
Subtotal	31.9
Government revenues:	
Import duties	24.4
Surplus funds	43.7
Subtotal	68.1
Total	100.0

Although this distribution may not be representative of all imported refined white sugar, it is not atypical and shows that a substantial portion of the wholesale revenue goes to government (68 percent in this case). However, it should be noted that sugar was imported at an exchange rate of only VN$80 to US$1, which was substantially under the actual exchange rate. This reduces the net amount of revenue to government. Refined white sugar represented 60 percent of the sugar imports in 1970. The balance of the sugar imports were in the raw form and a similar breakdown of the wholesale price was not available; however, the government's share would be expected to be lower because the cost of refining in Vietnam is greater than the delivered import price differential for the two sugar qualities.

This analysis is supported by the 1970 Annual Report of the Vietnam Sugar Company. This "firm" sold over 80 percent of the imported sugar, approximately half of which was imported as raw sugar. Of the VN$8,312,608,000 gross revenue this company had from sugar sales, 22.9 percent went to the Sugar Development Fund and 37.4 percent to taxes. This means that over 60 percent (VN$5 billion) of the company's gross revenue was returned to government. In 1971 the government's share was even larger, as the wholesale price was at VN$100 per kilogram, with only moderate changes in the cost of importing white sugar.

The current formula for wholesale pricing of imported raw sugar is summarized in Table 4. Taxes are comprised of the import duty (25 percent of the delivered import price), an excise tax of VN$1,020 per M.T., an assessment for the Sugar Development Fund of VN$10,000 per M.T., and a production tax of 7.2 percent of all accumulated costs, taxes, and other charges. Also, any difference between the fixed wholesale price and total costs as determined by the formula goes to the government.

PROJECTIONS

Consumption

The consumption information previously presented for Vietnam (see Table 2) shows the uncertainty with respect to the accuracy of some of the data. This was due to the difficulty of estimating artisan sugar production and the level of illegal exports. The increase in per capita sugar consumption from year to year has been erratic because of this, to say the least. Excluding artisan sugar production and illegal exports, consumption was estimated to be 16 kilograms per capita in 1971.

World sugar consumption for the past decade has increased at slightly better than 3 percent annually, and is expected to continue that trend in the 70's. Vietnam certainly has increased at a much faster pace, but cannot be expected to continue the rate in the future. There are at least three reasons for this: (1) already high per capita sugar consumption relative to other parts of Southeast Asia, (2) less growth in consumer disposable income, 2/ and (3) high sugar prices. Nevertheless, sugar consumption should increase faster than the 2.6 percent rate of population growth. It should at least approach the world growth rate of about 3 percent per annum. Projections through 1980 on this basis are as follows:

Year	Total consumption (1,000 M.T.)
1972	309
1973	318
1974	328
1975	338
1976	348
1977	358
1978	370
1979	380
1980	391

2/ The income elasticity for sugar in Vietnam was estimated at 1.2 by FAO in 1966 (see Agricultural Commodities--Projections for 1975 and 1985, Vol. 2, Food and Agriculture Organization of the United Nations, Rome, 1967, p. 106).

Table 4.--Cost formula for white sugar refined from imported raw sugar

Type of expense	Cost formula/M.T.	Accumulated formula/M.T.
1. Cost + freight = C+F in US$	(C+F) 400	(C+F) 400
2. Insurance @ 4 percent	(C+F) 16	(C+F) 416 = CIF
3. Bank expenses @ 3 percent	(C+F) 12	(C+F) 428
4. Tax @ 25 percent	(C+F) 107	(C+F) 535
5. Unload & transport to warehouse	(C+F) 0 + 2,114	(C+F) 535 + 2,114
6. Losses in transit & processing at 12 percent	(C+F) 64.2 + 253.68	(C+F) 599.2 + 2,367.68
7. Processing cost	(C+F) 0 + 9,555	(C+F) 599.2 + 11,922.68
8. Transport from factory to warehouse	(C+F) 0 + 434	(C+F) 599.2 + 12,356.68 = A
9. Excise tax	(C+F) 0 + 1,020	(C+F) 599.2 + 13,376.68
10. Interest allowance @ 24 percent for 1 month	(C+F) 11.98 + 267.53	(C+F) 611.18 + 13,644.21
11. Profit @ 5 percent of A	(C+F) 29.96 + 617.83	(C+F) 641.14 + 14,262.03
12. Sugar development fund	(C+F) 0 + 10,000	(C+F) 641.74 + 24,262.03
13. Production tax @ 7.2 percent	(C+F) 45.56 + 1,746.86	(C+F) 687.30 + 26,008.89
14. Tax adjustment factor = 0.99549 of line 13	---	Pr = (C+F) 684.2 + 25,891.59

Where Pr = Total cost at wholesale/M.T.
PV = Selling price/M.T.
PV-Pr = Profit to government.

This represents a 30 percent increase by 1980 from the 300,000 M.T. consumed in 1971.

Prices

Currently there is a slight scarcity of sugar in the world. As a result, spot prices at greater Caribbean ports in 1971 increased 20 percent over the average monthly price for 1970. This shortage is not expected to continue; it is a cyclical phenomenon. The last such occurrence was in 1963, when the spot raw sugar price peaked in November at US$0.256 per kilogram. In the succeeding 38 months the spot raw sugar price declined by 88 percent to a low of US$0.03 per kilogram in January 1967. Spot prices are not expected to reach either of these extremes over the next several months 3/. World sugar production is expected to make up the current stock deficit plus the normal increase in demand over the next 2 or 3 years, and prices will move to more moderate levels. If the cycle continues as expected, prices will eventually reach a low, unprofitable level and a new price cycle will begin.

In summary, prices paid by Vietnam for imported sugar are likely to be higher in 1972 and 1973 than this past year; but, a return of prices to usual levels can be expected for a few years thereafter.

CURRENT DEVELOPMENT PLANS

Plans have been made, at least tentatively, for development of sufficient additional sugarcane processing capacity to meet a substantial part of Vietnam's sugar requirements. Specific geographic areas and plant sizes have been selected which would lead to production of an additional 260,000 M.T. of sugar annually.

Initial plans are, of course, to get enough sugarcane produced to place in operation the three sugar mills that are currently setting idle. As mentioned earlier, security problems are a major deterrent; but, also, there are the problems of pricing sugarcane to get an adequate supply response close to each plant, and providing transportation for the assembly of the sugarcane.

Plans have been made for building a sugarcane mill near Tuy Hoa in Phu Yen Province by 1975. The proposed plant would have a capacity of 30,000 M.T. of refined sugar annually. A private firm reportedly applied for permission to construct and operate this facility, but did not receive permission from the GVN. The firm did operate a sugarcane experimental farm in the area at one time. Results of those tests indicate that, with irrigation and good cultural practices, sugarcane yields of 80 M.T. per hectare can be obtained.

3/ United States Department of Agriculture, "Sugar Reports," No. 235, U.S. Dept. of Agriculture, Washington, D.C., December 1971.

One other area currently receiving attention as a site for sugarcane production and processing is near Phan Rang, in Ninh Thuan Province. This Province receives the lowest rainfall in all Vietnam, but the Danhim Dam now makes possible the eventual irrigation of about 20,000 hectares of land. Tests are underway on the Nha Hoa Experiment Station Farm to determine best varieties and cultural practices. Results have shown that high yields per hectare can be obtained. Furthermore, because of the limited rainfall, the processing season may be more than twice the length in other Vietnam areas.

The Vietnam Sugar Company plans to begin a pilot operation at Phan Rang in 1973 with the planting of 600 hectares of sugarcane. This cane will be ready for milling in 1974. A small mill with a daily capacity of 400 M.T. of cane will be moved from Hiep Hoa to Phan Rang for the pilot project. If tests come up to expectations, a plant with a daily processing capacity of 4,000 M.T. is contemplated. Annual output of this size plant could exceed 100,000 M.T. of sugar.

Other geographic areas that are considered by the Sugar Development Committee to be potential locations for sugarcane mills, the size of mill proposed, and the first year of projected operation are as follows:

Location	Annual output	First year of operation
	(1,000 M.T.)	
Bien Hoa	15	1978
Binh Dinh	30	1979
Lac Thien	25	1979
Quang Nam	30	1979
Tanh Linh	30	--
Total	130	

The Bien Hoa refinery for affinated sugar is scheduled to be phased out in 1979.

Very little attention appears to have been given to alternative land uses, except possibly rice. For example, the Phan Rang area has unique climatic conditions. With irrigation, other crops such as tobacco, cotton, fruits, and vegetables might be grown more profitably and contribute more to the Vietnamese economy in the long run than sugarcane.

ALTERNATIVES FOR SUPPLYING VIETNAM'S SUGAR REQUIREMENTS

The appropriate means for supplying the sugar requirements of Vietnam are not necessarily limited to domestic production and processing of sugarcane. Other options may be equally acceptable or even preferable. For example, the

present facilities could be used for processing raw sugar and sugarcane, with the balance of the requirements imported. Or, perhaps, use of the present facilities plus new facilities in two or three of the proposed areas, with the balance of the requirements imported, would be preferable. The opposite of meeting the sugar requirements by processing sugarcane is to import the total sugar supply.

Several factors affect the choice of one of these alternatives. If all other considerations were placed aside except effect of sugar imports upon trade balances, the decision would be to go the sugarcane route. On the other hand, when the income of growers, comparative advantages, and revenues derived by government and their uses are placed in perspective, the best choice may well be to import all or a major portion of the sugar requirements.

Import Refined White Sugar

All sugar is currently imported, except for the artisan mill production. In 1971, 60 percent of the imports were refined white. The option to import all white sugar would idle the two refineries that are now processing imported raw sugar. This consideration is not to imply that such action should be taken at this time; rather, at some future date, one or both of these plants might be phased out of production.

The assumption of constant prices was made for this analysis. Using the average raw sugar price (c.f. Saigon) for 1969-71 of US$110.89/M.T. plus the US$25/M.T. differential for refining and additional freight, and consumption projection for 1975 of 338,000 M.T., the following results are obtained:

Item	Amount/M.T.
Cost of white sugar (c.f.) VN$400 = US$1	VN$54,356
Insurance, interest, banking charges, etc.	5,605
Unloading, temporary storage, handling fees, losses	7,225
Total cost at wholesale net of all taxes	67,186

Under this alternative, white sugar could be made available at wholesale for VN$67.2 per kilogram net of all taxes. Foreign exchange necessary for this program in 1975 would be US$46 million.

Import Raw and Refined White Sugar

This option is essentially the current situation where the refineries are used to process imported raw sugar and the balance of the requirements are met from imports of white sugar. For purposes of this analysis, the assumptions and specifications made for white sugar imports apply, plus these additions: The price (c.f. Saigon) for raw sugar is the 1969-71 average of US$110.89, and the annual refining capacity is 180,000 M.T. of affinated sugar from raw sugar

and 110,000 M.T. of white sugar from raw sugar. A total of 48,000 M.T. of imported white sugar would also be required to meet the projected consumption for 1975. With this arrangement, the following results are obtained:

A. Refining of raw sugar into white sugar

Item	Amount/M.T.
Cost of raw sugar (c.f.) VN$400 = US$1	VN$44,356
Insurance, interest, banking charges, etc.	4,701
Unloading fees, transit, and processing losses	9,920
Processing charge (raw sugar to white sugar)	13,495
Total cost at wholesale net of all taxes	72,472

B. Refining of raw sugar into affinated sugar

Cost of raw sugar (c.f.) VN$400 = US$1	VN$44,356
Insurance, interest, banking charges, etc.	4,555
Unloading fees, transit, and processing losses	6,235
Processing charge (raw sugar to affinated)	9,459
Total cost at wholesale net of all taxes	64,605

Under this option, all refining facilities are utilized to capacity and considerable quantity of the lower priced affinated sugar is provided for consumers. Affinated sugar comprises slightly more than half of the available sugar and may be more (relative to white) than consumers would want by 1975. Foreign exchange requirements under this alternative would be approximately US$39 million.

Utilize Current Refining and Milling Facilities

With this plan both sugar refineries and all three sugar mills would be utilized. Assumptions and specifications are otherwise the same as those given for the two previous situations. The combined capacity of the three mills is 55,000 M.T. of plantation white sugar. Total processing capacity exceeds requirements for 1975 by 7,000 M.T.

Only the processing of sugarcane has not been previously analyzed with respect to costs and revenues. The cost of producing sugarcane was not determined as part of this study; consequently, a price that could be paid the grower for sugarcane was derived as follows:

Item	Amount/M.T.
Gross revenue (based on cost of imported white sugar at wholesale)	VN$67,186
Cost of processing (estimated)	30,000
Net return to raw product/M.T. of sugar	37,186
Derived sugarcane price (sugar yield = 10 percent)	3,719

The derived price of VN$3,719 per M.T. of sugarcane delivered to the sugar mill is considerably below the VN$7,000 to VN$8,000 price currently being discussed by growers and processors. Moreover, the assumption of a 10 percent sugar yield is not likely to be achieved, and the derived price would be reduced accordingly.

Foreign exchange required for this plan totals US$34 million, but it assumes that the required sugarcane can and will be produced for the mills. The production phase of the overall study will evaluate the supply response for sugarcane at various price levels.

Self Sufficiency in Sugar Production

Vietnam cannot become self sufficient in the production of sugar from sugarcane by 1975; a longer lead time is necessary for planning, plant construction, and initiation of cane production. Perhaps it could be done within the next 10 years if deemed economically feasible. In order to become self sufficient by 1980, these requirements must be met:

1. Projected annual sugar consumption of 390,000 M.T.
2. Sugarcane production of 4,330,000 M.T.
3. New mill construction for cane (3,730,000 M.T. capacity).

The latter is equivalent to 18 new sugar mills the size of present mills. Investment capital to construct the milling and refining capacity to produce the necessary sugar would be in excess of US$100 million.

No foreign exchange would be used to import sugar under this plan; however, a major portion of the replacement parts and equipment required annually to maintain the mills and refineries would be imported. This would amount to several million dollars (US) each year. So the savings on foreign exchange by becoming self sufficient in sugar production are not net savings.

RECOMMENDATIONS

The GVN, through its own sugar companies, has embarked upon a plan that has self sufficiency in sugar production as its long term objective. Efforts toward achieving this goal have been delayed considerably because of the war. The comments and recommendations that follow are not intended specifically to assist in reaching self sufficiency, but to delineate ways of improving the economic efficiency of the industry and assisting the overall development planning of the agricultural sector for maximum economic growth. The recommendations are not necessarily in the order of highest priority.

1. A moratorium should be placed on investments in new processing facilities until the economic potential for the industry has been more fully clarified with respect to:

    A. The comparative advantage of sugarcane production over competing crops.

    B. Estimates of sugarcane supply response for the three mill location areas and other prime production areas.

    C. Utilization of the present three sugar mills.

    D. Security problems as they relate to sugarcane production.

2. Merge the three government owned sugar companies. Benefits likely to be derived from this include better utilization of management and supporting technical and clerical staff, more coordination of planning and developmental activities, and greater efficiency in product distribution. A study of the organization and operation of this "firm" by a management consultant team should be considered.

3. Study the economic feasibility of making needed additional investments (1) to make the Hiep Hoa and Binh Duong plants fully operational and (2) to provide the support equipment, roads, and canals for the assembly of a continuous daily supply of sugarcane. This economic analysis should evaluate alternative raw product pricing schemes, including less than break-even processing margins where one or more of the plants is otherwise infeasible. The latter scheme would be utilized in the short run to encourage growers to begin growing sugarcane and/or to make use of a plant that has no alternative use, including relocation. Plants with daily capacity of 3,000 M.T. of sugarcane are considered to be minimal size for economical operation.

4. A plan should be developed and initiated that will provide growers adequate protection from losses due to war if they are to be encouraged to produce sugarcane for commercial mills.

5. A comprehensive analysis of the Vietnam sugar industry should be made if sugarcane production has an equal or greater comparative advantage than competing enterprises. This analysis would be a long-range development plan that would optimize use of resources for sugar production given the annual constraints on new investment capital. The study should determine the size and location of facilities which will minimize costs of assembly, milling, refining, and distribution over the planning period.

6. Pricing of sugarcane should be based on cost of production plus a reasonable profit for the grower--or on the returns to the best crop alternative if another crop has greater potential than sugarcane. Likewise, the processor's margin should be based on costs. This recommendation is made because the government fixes the price of sugar. Any residual revenues would automatically go to the government. Likewise, any deficits resulting from the fixed price being too low should be reimbursed by the government.